

DRAGON USER

International edition

The independent Dragon magazine

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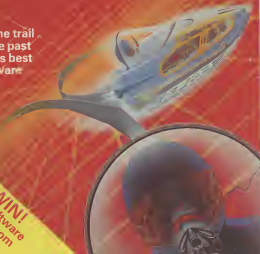
January 1994

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Dragon User will be made up of a very great

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Club plus Dragonder criticized and de-
fended a pause alternative a hard-
core version of person

News

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soon to use with your Dragon

The year's best



John Screen looks back over the past
year's offerings of software and picks his
favourites

Upgrade options

Upgrades — the alternative to buying a
new kit — get the once over from Kells
and Steven Davis

Machine code

Steve Davis gives a few hints to Dragon
users wanting to break into machine code
programming

Switchback

Our program of the month really tells it
you are on the ball

Drawing up

What is making your program a virtual item
all the others? Margaret Bennett shows
Dragon users all the little things that can
turn a program into something special

TV testcard



John Updell explains how to test your
television's suitability for use with a com-
puter

Open File

Ben Waves Interlan Landings. Screen
print. Finding the rightest common factor

Dragon Answers

Steve Davis answers readers' questions
about their machines — this month includ-
ing advice on cassette recordings to work
with the Dragon

Competition Corner

This month we give you the chance to win
a whole library of software — 70 titles in all
— from Dragon Data

Editorial

THE DADA of the official Dragon 32 upgrades is continuing with Dragon Data being
dropped by elements of this issue in the past

Projections on the cost and timing of the upgrade failed considerably during the
course of last year. First an expansion box giving 64K of RAM was proposed for the
middle of May. Then the add-on was expected to cost about £200. By June this had
become almost dead in a sea of £75. A month later plans had changed to a CPU swap
scheduled for September at an expected cost of about £100. This swap was to give
Dragon 32 users 64K of RAM, too (640K) and an 80803 interface. At the time Tony
Clarke, Dragon Data's former managing director, explained that software compatibility
was behind the second thoughts — the proposed CPU swap would enable Dragon 32
software to run on the Dragon 64.

However, some elements with Data Model really enabled as managing director and
the plans had become less specific. Now it seems possible that the company is having
further second thoughts — preferring to exchange Dragon 32s for 64s rather than
upgrade them. The logic of a price/wage would certainly be simple. I have
swapped CPUs which would originally have involved serious surgery. Less certain is the
reaction of Dragon users to a new set of such a proposal — even to tell us what you think
and we'll make sure you're not the last to know.

Part exchange would be a new idea in this country, although Commodore used it in the
US, reducing the price of its 64 to 1000 persons returning their Commodore
however this had been so generous about software compatibility. The American
company has been careful to split the market for its two home computers, so that 1000
users moving to a 64 had 64 have been left with redundant software. Commodore does
not seem to have suffered too much from this auto-operative attitude and some people
argue that Dragon Data should have taken a lesson from the American company's book.
The suggestion is from businessmen in the micro industry rather than from those users of
the Dragon Data's intentions may be too noticeable for its own good — again, as we
know what you think.

SUPERIOR SO

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- EDIT+ is a Full Screen Editor and Programmer's Tool Kit. It is an excellent aid for writing programs in BASIC and is easy to use for the novice as well as the experienced programmer. EDIT+ includes all the features of HI-RES. Up to 23 lines of your program are displayed on the screen and can be changed by overtyping, inserting, or deleting characters. Functions include: Find String, Change String, Copy Text, Goto Specified Line, Scroll Up/Down, Append from Tape and Enter Basic Command. No Graphs is complete without an EDIT+ £34.95

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- Plug the HI-RES cartridge into your DRAGON and you will immediately see the improvement. The screen displays 24 rows of 51 characters with proper lower case and BASIC works as normal but with extra features. Selectable character sets: English, French, German, Danish, Swedish, Italian, Spanish, DTP/TC Graphics, Replaceable Characters. Improved keyboard action with autorepeat allows faster typing. Graphics and text can be moved on the screen. Suitable for educational and business use. £25.30

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DASM is a versatile assembler designed especially for ease of use on the DRAGON and allows you to assemble machine code while still retaining the full use of BASIC. Supports all 6800 instructions and modes. Allows any length for labels (the first 5 and the last characters are used). Full support for output to printer. Recommended for the beginner. £28.95

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A powerful machine code monitor which allows you to delve into the internals of your DRAGON as well as helping you to debug your machine code programs (and BASIC programs using PEEK and POKE) includes: Examine/Change memory. Examine/Change registers. Print Screen Set (breakpoint). Test Memory. An essential tool for all machine code users. £28.95

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- It has all the features of both DASM and DEMON in one package. DEMON is the natural partner to DASM, complementing each other perfectly. Write, test and use your programmes without the bother of reloading. It is extensively featured in the new book by Ian Secker on Dragon Machine Code. It is the ideal combination for the machine code user. £30.45

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Letters

This is the chance to air your views — send your tips, compliments and complaints to Letters Page, Dragon User, 13-15 Little Hampden Street, London WC2R 2LQ

Calling all clubs

I WOULD like to know if there are any microcomputer clubs in the South Lancashire area for beginners. So far I have not been able to find any after two months of searching.

J Wong
Loughborough
Leic

Dragondos criticised

WE think we have found two bugs in the Dragon 32 disk operating system.

The first is related with the CHKDSK command. This command scans the root in fact and scans a selected program using the same code as the first program. The bug is, it sometimes pushes the program into the disk as a utility, causing the program. Possibly this can be overcome by inserting a FREE command in conjunction with the CHKDSK command.

The second is a lot more serious and concerns the FILE command. The syntax for the FILE command is FILE [drive]: FILE NAME SAS for a file on a disk or an SAS for a machine code program. The use of a diskette can be made easy with a disk maintenance program. The only way you can say command and type the program's name, the disk update software (control by example INPUT FILE NAME) LOAD PS + [SAS]

This will LOAD the program to the disk but the FILE command cannot accept a STRING VARIABLE. All other commands seem to be OK.

M France and G David
Canal

... and defended

I READ the recent article by Keith and Steven Bann comparing the Dragon Disk and Printer disk systems, with interest (and by the end of the article some indignation).

I do read the CD and regularly since it brought it in last September has had a very useful for program development. From my standpoint several of the features the authors viewed as very useful. The information dis-

tributed of a backup file removes the possibility of a too frequent disk error, creating a new file (sometimes with nothing in it) with the same name as a deleted older version.

Equally important, it is reassuring to find the dictionary is displayed with pages 10 and 20. Even if the typical commands (especially AUTO) are also surprisingly useful and make for a more user friendly system (a character into the screen might help deal). Everyone is entitled to his own view on the value of these commands (and I'm clearly quite happy with them) however when it comes to the question of file structure, I find myself at variance with your authors over matters of fact.

On the issue then, definitions, the two principal file types are "random access", in which each record can be read from or written to independently, and "serial files", in which to discover a particular item you must start from the beginning and work your way through all the items in sequence until you find what you are looking for, and in which "loading data to, or deriving data from the middle necessitates re-writing the whole file. They claimed that file handling capabilities of Dragondos are relatively simple and effectively restricted to the serial type, and that the example given in the Dragondos manual printed accumulated random access, really disastrous, a rather inefficient and slow file with lots of blank space in it.

This would indeed be an important criticism, if true. Once reading these comments, I spent some time playing around with these so-called random access routines and looking at the results on disk using DRAGDO (a function the Banns pass quickly over).

It appears that the technique is the actual disk record replace

new data in a record in the bytes vacated by the old record, without rewriting the whole file (there are no "holes" except those that pad out the final length record) and that it accesses all records on an equal and rapid basis (the complex structure of the Dragondos dictionary would be a waste of time if it were otherwise). However, that file is a random access, rather than a serial file, again does not really require deep study — it is evident just in using a few lines.

J Paul
Bristol

A pause alternative

IT IS often necessary to pause a program by either using the FOR LOOP method such as
FOR I = 1 TO 500 NEXT I
or
TIMER = 0 IF timer = 500 THEN

But these methods can be both time and memory consuming. A much better method, especially if you only want a relatively short delay in the program is to use the Dragon's PLAY command by typing PLAY P1, which gives a delay of about 2/10 seconds as PLAY P2 for a shorter pause.

J F Gair
Maidhead

Harder Pontoon

WE HAVE enjoyed playing with the Pontoon game submitted by I. Saunders (plus the November "tidle" but thought that readers might be interested in this slightly more elaborate (and harder) version.

The following features have been added as it is more complex

in 1 or 11 (most of the calculations for this was in the original), the computer is allowed to lead 4/5 extra card and dealers allowed to do so as a 10 at random, a first card 1 has is awarded with a fine.

As the technical side, the FORG have been removed since they're not necessary in this type of game, you can spend things up by shortening the wait loop if you wish. Defined functions have been used to calculate the card value and the deal for you.

The changes to the original version are as follows:

```

60 DEF FNAC( ) = INT( ) - 11/10
67 DEF FNAC( ) = FNAC( ) - 10 - 11/10
100 FOR I = 1 TO 500000
1000 GOTO 1 - NEXT I
300 F-PT = 1 - 10-400-300
510 IF F-PT = 0 THEN
510
330 IF M Check for Aces
350 F-PT = 21 AND F-PT( )
THEN PT = PT + 10 F-PT = 0
360 IF PT = 21 THEN CLS
4 PRINT @ 230 "SOPHIE"
YOU VC DASTY I, ON = ON
+ 5 SACSIN 500-500-500
400
380 IF CT < 10 + FNAC( )
THEN L = 21 CT =
C00 500-500-500-CT = CT
+ 1
390 FOR X = 1 TO 3 IF CT = 21
AND F-PT( ) THEN CT
= CT + 10 C00 = 0
387 NEXT X
407 IF CT = 21 THEN CLS
4 PRINT @ 230 "SOPHIE"
YOU VC DASTY SOULD
100 5-500-500

```

Lines 410, 420, 430, 440 can all be simplified in a similar way
425 IF 4 = 5 THEN GOTO 5
5 PRINT @ 410 "YOU
CARD TRICK" FOR I = 1
TO 5 PLAY
- 1000-1000-1000
A 500-1000
460 SCREEN 1 FOR A = 1 TO
1000 NEXT A-500-500-500
500 FOR A = 1 TO 1000 NEXT
A GOTO 80
100 500-500-500-500-500
to wait entry more games
570 RETURN
410 S = FNAC() + 1
450 IF 10 - 10-400-500 < 10
THEN T = 10 10-400-500
500 SCREEN 0-1

We find that it is much harder to beat the computer at this game and speed really has to be the object for players!

J Paul & Steve
Sunderland

Software Top 10

1	(4) Frogger	Montréal
2	(7) Blinn Out	Discovision
3	(4) Outback in the Jungle	Montréal
4	(1) The King	Montréal
5	(10) Ring of Darkness	Winnipeg
6	(1) Champion	Parkwest
7	(1) Penetration's Diary	Standa
8	(1) Stone Data Bank	Goldsmith
9	(1) Dragonfly 2	Hewson Consultants
10	(1) Simple	Standa

Chart compiled by Boots



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your
Enemy
from
below
the
waves!*



Kriegspiel



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of snow and out of it -
their Tanks!*



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Part-exchange path preferred

DRAGON DATA has decided to part-exchange 32s for its rather than upgrade them.

The renowned cost of the exchange to a 32s user is £140 (saving £86 off the cost of a Dragon 64 — possibly less than can be realised by selling your 32 second-hand).

This price and the policy itself mark a change from the

company's original intentions. Earlier in 1983 Dragon Data was proposing to offer an upgrade service at a price which eventually rose to about £180.

Some users are likely to object both to this change of policy and to the cost involved.

Adopting part exchange not only breaks with Dragon Data's previous statements

but also with tradition.

Only Commodore has pursued such a policy, and that only in the US where it dropped the price of its CBM 64 to 1/10th owners returning their machines.

Full details of the part exchange are contained in the December issue of Dragon Data's newsletter *Stop Press*.

New home for Ninja Warrior

A ROM over US\$1000 of additional cassette from American software house Programmers Guild has been sent.

The cassette, among the best sellers in the US and including such titles as *Ninja Warrior* and *Matrix* 2, are now being distributed by Program Factory, 36 Railway Road, Caversham, Lancashire.

Program Factory is also handling previously printed orders sent to Programmers Guild UK — and will be handling any new US titles which cross the Atlantic.

Monster challenge

A PRIZE of £10 000 could be yours if you solve five games from Targ Systems Software and then win to Courtroom Quiz.

The suite of six games, developed in association with law policy David Lee Tress, are designed to test your intelligence, powers of reason and keyboard dexterity.

David promises: 'These games will have people beating their heads on the floor with frustration.'

But if you can solve the first

five you'll be eligible for the Courtroom Quiz, whose winner will receive £10 000.

At the moment the games run on the BBC and Sinclair micro as well as the Dragon Data C64 65.

David added: 'We know the games are difficult — as just don't know how difficult. So we don't know how long it will take us to get the 10 finalists together.'

Targ Systems Software can be reached at 6 High Street, Wandsworth, Surrey.



David Lee Tress: 'We know the games are difficult.'

Dragon Data software push

DRAGON DATA is stepping up its attack on the software market, issuing new titles for the 32 handling games for disk users and marketing professional packages for the C64's operating system.

The range of new games for the 32 includes arcade titles, adventures and simulations — alone and in combinations.

For example, *Lunar Rover Patrol* is an arcade-type game using 'support graphics' to simulate the moon's surface while another top computer two games, the arcade *Brexit* and the adventure *Middle Kingdom*.

Other adventures include *Isling*, *Minotaur* and *Magi* and a trilogy from US software house Colossalport. Simulation titles have *Ten-off* and *Flight to the forward*.

Dragon Data has also licensed *Image Master* from Intelligent Software, the pro-

ple behind the steady available *Chess*.

Of particular interest to readers of Dragon User will be the arrival of *Junior's Revenge* whose author was interviewed in our October issue. This is a Dragon version of the arcade classic *Dankey Kong Jr.*, as Microsoft's *The King of the Doozie King*.

All these games will be appearing in new packaging of video cassette-tape cases — as will the previously announced new releases.

Dragon Data also has plans for disk drive users. The company wants to make sure that 'people who buy drives don't feel left out', explained technical software manager Duncan Grieve.

Cassette and cartridge titles are being bundled together on disk in threes, fives and fives.

... to give, for example, an adventure disk.

The modular operating system C64-2 will now be available in January at a price of around £40.00. The software is ready but the manuals will have to be finished.

Dragon threes that C64-2 is Dragon's response to the small business/personal home user market — particularly in the light of the system and application software that will also be available early next year.

System software includes *Pascal* and *Basic* C64 a structured version of *Basic* which is still aimed to *Pascal*. In fact Duncan says: 'It's got as many extra features you can't really call a *Basic* any more.'

A C compiler will give the system 'a high degree of portability so that any program that runs under Unix can run under C64-2.'

These languages can also be used together under C64-2 with each module being well-tailored to the source language most suited to the task.

Applications software includes a word processing package called *Stylograph* or *200-00*, *Dynacalc* for spreadsheet analysis and *HRM* for database management, both at £50-00.

Stylograph, which benefits from the 64 by 24 line screen on C64-2, also offers a spell checker and mailmerge facility.

Duncan stressed that the 'experimental' pricing is no reflection on the packages' quality. These are very professional products which we can offer at these prices only because of our high volume purchasing and licensing agreements, he explained.

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Peaksoft sends its thanks, and the season's greetings, to the many new friends and customers made in 1983.

We need special thanks to all who have taken the trouble to write to us, and express our admiration for each individual as:

Richard Biles, who played *Champion* non-stop for 37½ hours to win the European Cup

David Spence, who tells us he managed it in 54 minutes (We think that's the record)

Rob, Terry, Mike and the two Dicks, who raised almost 200 for their youth club with a 24-hour "Champ-a-thon"

Ben Spence, who wanted the completion to leave very-mad-games-into-a-state-of-being-misconceived, and achieved (by himself) a record score of 1,480

Peter Black, who reached the 8th screen of SAS (even we haven't done that without cheating) before being sent by a helicopter

We look forward to renewing old friendships, and making many more, in 1984

Talking to your Dragon

LOW COST speech recognition next spring is the promise of Brighton-based Orion Data.

Called Micro Command Orion's speech module takes taken commands spoken via a microphone into signals which your Dragon will understand.

The module with microphone attached slots into the Dragon's edge connector socket.

A Teach program loaded from cassette allows you to train the Dragon to recognise up to 16 words you speak into

the microphone. A Listen program then checks that the words are being recognised correctly.

An instruction booklet explains how to incorporate the spoken commands into your own programs or use them to replace keyboard or joystick control in other games.

The cassette also contains *Shespeak*, a game which already uses speech commands.

Micro Command already runs on the Spectrum of 128Kb and Orion expects to have a Dragon version available at the same price next spring.

Included in the price are the speech recognition module, microphone, cassette and instruction booklet.

Orion Data's address is 2 Cavendish St, Brighton, Sussex.

Windrush bring in Bug-Zapper



Inside Windrush Micro Systems Bug Zapper EPROM programmer

THE latest programming tool from Windrush Micro Systems is Bug-Zapper an EPROM programmer which takes its place alongside the Micro assembler and D-Bug disassembler.

Bug-Zapper plugs straight into the Dragon's cartridge port and needs no extra power supply or batteries. It is a development of Windrush's professional EPROM programming which is directly in use on C80-85 and Pico, the two main working systems for 8088-based micro.

The cartridge includes an EPROM with all the software necessary to operate the programmer. The choice of the menus provide a range of facilities.

For example, you can FILL the programmer buffer with specified hex characters, MOV's data within the buffer, EXAMINE/COMPARE the contents, and then CLAMP them to the screen as pattern.

Bug-Zapper costs £79.95 complete with documentation. For an extra £18 you can buy the EPROM programmer and Micro on the same cartridge.

Micro is Windrush's initial assembler/monitor which sells at £29.95. It also comes in a combined cartridge with D-Bug for an extra £10.

Bug-Zapper's trace/monitor/ assembler package costs the same as Micro on its own. Cartridges of other cartridges are being offered at £15 trade-in allowance.

Desert Island Dragon delights

John Scriver picks his favourites from the past year's offerings of software - reviewing arcade titles, crib tables, strange lands and programmes' benches

ALL THIS TIME of the year, there may well be more timely disputes than usual over TV sets. With parents and kids all at home at the same time, even the family with two sets could find themselves at sharing these out daily. The delights of *James Bond: Top of the Pops* and *The Incredible World of Denny* have to be carefully weighed against alien destruction, maze mazes, lion and the word delirious program if someone is also being asked that you would indeed be lucky to get through unscathed.

My advice would be to buy copies of *Radio* and *TV Times* as soon as possible and give up a satellite of TV use if you want to avoid the divorce courts at the time. But that's only five years ago these were hardly just about in the future, few videos and only three channels to argue over, such is the pace of progress.

For those of you with any money left (at some sanity) after the Christmas mad race, I have been casting my eyes over this year's software as an attempt to suggest best buys. In the past I used to grade programs on a 1 to 10 scale for use as graphics speed, novelty, sound etc and end up with a league table of results. This came to be more and more difficult as I realised that so much depended on just what title had I have expected this approach usually. However, the prize came to me on his latest, emitting some thing about desert island castles and "which ones would you like to be married with?" Although was a threatening look in his eye, I decided to comply before I found myself surrounded with eight copies of invaders and my Dragon for company.

I have tried to spread the net as wide as possible to include a variety of programs, but undoubtedly there will be some good ones that escape.

My favourite arcade games tend to be those that deal with rather than pursue them, and those that show originality as well as fast action are more likely to get my vote.

On the mat

Ninja Warrior from Programmers Guild is an obvious choice here. Starting out as a martial arts training program, it soon came in difficulty to make TV's *Kung Fu* look like *Pleasant*. In this section game you end up to live characters, control a small

figure dressed in a judo suit. The ground scrolls beneath his feet, and you can use the joystick to slow him down, speed him up, or make him jump in the air. This is a

bottom controls has sharp kendo look.

To give a whole feel, the landscape is filled with obstacles that he can jump over, but a higher score is achieved by kicking them to dust. If he survives this without breaking his toes, the tests for higher grade belts, passing them with flying to jump over, go to converse and even smooch to catch. Eventually your warrior becomes a black belt. I find this a highly entertaining game, using a novel idea, smooth graphics and good sound. My one criticism is that the figure looks more like Ken Livingstone than Bruce Lee.

Me Tarzan, you Cuthbert

Cuthbert the Jungle is the most recent game in the Cuthbert series from Activision, and is by far the best in terms of graphics.

Using the joystick, you control Cuthbert, making him run to the right or left and jump. As he disappears off the screen on one side, he reappears on a fresh screen with some new hazard to contend with. These vary from logs and pits to scorpions, quiverbirds and alligators. Occasionally he finds his Tarzan and swings from carefully placed vines. Eventually he discovers several treasures that turn out to be collected and brought back before the clock runs out. In order to reach the late stage, you have to acquire different yells such as collecting white diamond gems are likely to open holes to fall in, swinging vines etc. Most interesting you can improve and get closer to the treasure. This game is well worth adding to any collection.

If you feel you really have to be an peasant to explore from outer space, then **Wonders** from J. Morrison Micros is an ideal program. In this game you are given the opportunity to go exploring against monstrous creatures that have occasionally escaped from some cosmic island. A group of these evil birds starts in a lair on the top of the screen. They then proceed to swoop down onto you while depositing something unpleasant on your head. If you run into one, you will explode so the only tactic is to try and shoot them before they get you.

As you stop your hero in order to collecting the wave, some innocent-looking eggs begin to hatch out revealing little devils who take over from their parents. Although you can never win, the path to destruction is accompanied by

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1991

Ugh!

DRAGON FOR
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1991

**5
to bring
your
Dragon
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and you are off to search for treasure. Each time you find a new treasure, it's a new treasure to search for.

There are two versions of the game. One is a 3D & Tetris action (386 recommended). One is a 2D & Tetris action (486 recommended). One is a 3D & Tetris action (386 recommended). One is a 2D & Tetris action (486 recommended).

UUGH!

The first Dragon action game for the Dragon. Uugh! is a 3D & Tetris action (386 recommended). One of the best of the popular arcade genre. Available in two versions: with and without super-fast-resolution mathematical graphics. Available on most of the best and latest graphics.

UUGH!

Your work ends on the surface of the planet of Uugh! to save a mass of people and resources. Super action, the fastest action game for the Dragon. One of the best new games for the Dragon 386 & Tetris 486 1991.

—I feel violence and should love anyone who's had to use the dry cleaners after walking through Trol algar Square recently.

Before you're let allowed into a space to flick such beasts as Vulture, you will undoubtedly need to show some sort of competence in flying spacecraft. This is why I have selected Space Shuttle from Microsoft. Standard flight simulators for macros are quite fun, but rarely before have come like the real thing, although they cope well with user input. They don't produce the subtle feeling in the pit of the stomach as you edge slowly out into a spin. Space Shuttle avoids these comparisons by watching as the cargo pilot if you fail to operate the controls competently enough.

Starting with a weather report, the program takes you through four stages in a complete mission. As the display changes to a view of the instruments and the clouds come, countdown begins and you rise imperceptibly through a banking of stars. Your first chance to control something happens now: as you leave the launch rocket behind, you have to use the control sitting position, although there is a small amount of leeway allowed. The next part of the mission is to rendezvous with a satellite. Using a joystick and the keyboard, you have to use microprocessors to align yourself neatly into place. Once you are close to your target, the doors have to be opened in the loading bay, and the robot arm extrudes the satellite which is then parked safely in the cargo hold.

As the doors close, you can fire forward thrusters to begin your descent through the atmosphere. The motors shut off and you control the final glide using only the joystick. Instruments are necessary in the initial stages, but eventually they disappear through the window and the landing can be achieved visually.

After you land successfully — or crash — a debriefing report tells you where you went wrong during the mission. As you are a trainee pilot, the auto-pilot takes you from the next mission, and you called points according to how close you came to the ideal rule. It would be better if you could miss out the stages that you find easy and concentrate on the more difficult parts, but it is still an enjoyable program that needs careful thought as well as agile fingers.

Graphic horrors

One of the first games I saw but showed well could be done with Dragon graphics was Phantoms (Slayer from Microsoft). Adapted from an American program for the Tandy Colour Computer, this involves tearing round a hedge-lined maze while avoiding its unpleasant guardians. These are phantoms who spring out at you and are difficult to destroy even though you are armed with lasers. The best technique is to shoot fast and run for cover behind a hedge whenever you see one. The graphics are excellent, showing not only the hedges at each location, but their changing appearance as you are moved forward of carefully circling you 90 degrees where the ghost slowly speeds up just as a way that must make other games writers

feel jealous. There is a subtle warning of the approach of the phantoms as well as a warning program to allow you to get used to the controls. There are two types of maze available, and the result is a realistic, high-speed game.

The last action game I have included is Demons from Dragon Data. I was cautious about including this program as it is available on a cartridge and I still feel that these are overpriced. Where most people might buy a good chess cartridge, or a utility package on cartridge, they would certainly be nervous at spending £20 on a game that could prove boring within a few days. Demons happens to be shy because from the games I for others are made different versions of Pac-Man, although I know several people who find it exciting beyond belief.

Steering a little man round a room, you have to destroy robots while avoiding electrified walls and something called a malignant medicine ball. As you rush for an exit, a new room scrolls across the screen, and the game becomes in effect. Although fairly simple in concept, Demons is fast and well-written.

M-C delights

There comes a time when the speed and facilities offered by Dragon Basic no longer satisfy the programmer, and he or she wonders if it might not be worth the effort of learning to program in machine code, or at least to use some micro routines in Basic programs to speed the action up. Accessing the 66000 is easy on the Dragon, but simply entering text upon line of meaningless numbers is intimidating and time-consuming, which is why I have included in this collection of software an assembler package, Mace from Mindrush Micro Systems. This cartridge also contains an editor and a monitor and is indispensable to the micro programmer. The documentation is 66 pages long and is fairly clear. Apart from general instructions, it gives a detailed breakdown of the 66000 instruction set, use of interrupts and monitor and editor commands, 26 well 26 examples. On (typing in, switching on and entering BASIC) 49/52 you find your self in editor mode. This gives you 20 options including insertion and deletion of program lines, search and replace strings, load and save from tape and assembly go to system monitor or exit to Basic. There are 14 assembler directives and 14 assembly error messages and the monitor allows breakpoints and jumps to subroutines, both vital to fine-tuning. If you end up on a desert island with this cartridge and your Dragon, remember to ask Ray Phantoms for either Universals or Data books on 66000 programming.

Although there are several card games available for computers, none of them seem to have life past. There is even a rather neat version of ship poker suitable for the Apple, but choose which of two battles you would like to play against, one rather incompetent and the other a world-class player. I'm not sure what you're expected to do as you gain points



One of the most subtle horror games



To take a load of stress off a Mace



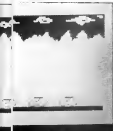
and go on the man in the



Wizard's Tomb from Salamander only



Tomb in Franklin's Tomb, and then



Wizard from Phantasmagoria, Quest

from the triple player, but you'd have to enjoy frustration quite a lot to sit there in your socks as the demon player reveals the score, but eventually this game ends quite well in the bonus.

If you are going to play cards, then you need to find a game that is fun for the computer to play. One such game is *Crissage* from Pioneer Microsystems. In this you are each dealt six cards, of which two must be placed on the discard pile. The rest of the deck is turned up to show its face. The discarded pile melts up the 'top' which is placed in one side. Using the cards in their hands, the players take it in turns to place cards on a pile adding up the running total of all the while. Runs and doubles score points, as does making 15 or 31. The total must be higher than 31. When this point is reached, the totaling starts again. When all eight cards have been played, the players try to make 15 from their own cards (including the up-turned card on the top of the pack). They take it in turns to add the one score to their own. Scores are usually kept on a wooden board with holes in for matchsticks. The winner is the first person to move his or her matchsticks around the board.

The display is very clear, with the cards shown above the top of the screen, and the action lines are fast. Although I prefer playing this game in some big club out in the country with a pair of Widdow's 18, close at hand, this program is as good as you could get on a computer, and of course the Oregon does it make you buy the next round if you lose. (Well, not yet, anyway).

As with arcade games, choosing a favorite adventure game is very much a matter of personal choice. I enjoyed *Black and White* and the *Mindmap* and the more recent selection from *Dragon Gate* probably because they are all clearly influenced by the *Cosmo* engine (which I still enjoy playing occasionally). The two that I have included however, are *Wizard of Dark* from Wondersoft and *Franklin's Tomb* from Salamander.

In the dark

Ring of Darkness synthesizes text with graphics and is a Dungeons and Dragons type (fantasy) choice at the start. After discussing whether you wish to be human, elf, or dwarf as well as wizard, thief or warrior, you are shown a map of the terrain. Clearly shown are all the possible target places, such as lakes and towns. As you make your way using the usual control keys, you soon discover that there are nothing but bandits in the land. The sooner you start thumping them, the sooner you begin to collect weapons, gold and experience, without which there is little point in proceeding further. Clearly this game is not for the faint-hearted.

As you collect various possessions your load supply starts to run out. When you reach a town, you are shown a high resolution plan where you can purchase food, drink, weapons, spells and even advice. At this particular stage in the Middle Ages, someone has even invented an early hovercraft, and if you have

enough money, you can add this to your list of belongings. (Should you not be able to avoid the hidden archers I never could stand *Water Gabriel*, then you will be and be promptly reassured. This will cost you some possessions, but not experience points which are increased handsomely after the hovering event).

When you are well equipped, you can enter one of the underground places to continue your quest for wealth and fame. The necessitates, leading in a rather program that displays the maze in letters 30 even allowing you to see the requisite creatures that grip on you. Should you wish to climb the ladder to the surface once more, you simply select the original program, and your position and present state are merged into the new program. Since I first played this game, I have become more convinced that the extra features make it worth the rather high price of £10.

In the crypt

Franklin's Tomb is also rather more expensive than the average Oregon game, but it does come in smart packaging that protects the software and doesn't simply make a look more impressive, and it does contain a booklet. Most of the locations that are visited are listed clearly in it, and there is an introduction that sounds like Gave James reading from *Raymond Chandler*.

The game is set in the crypt of a graveyard, and takes you through many weird locations, several of which are really badly trapped. The locations are connected logically, which means that mapping is not too much of a problem. Hidden in various places are objects and clues that are essential on the other side of the maze of tunnels. The screen is split up into three sections: location description, personal inventory of things you've picked up, and a list of available exits (that's worrying when this goes later). There is a save file facility to save your present position on cassette, which is useful just before you launch yourself into the unknown. As this contains merely your present position and inventory, it only takes 30 seconds or so to load or save.

As you explore further through the tunnels, you begin to see the point of the game, and the location that you should be aiming for. When you reach there, you need to deposit certain peculiar objects that you have collected enroute. If you succeed in this, you are free to go out and buy the sequel *Lost in Space*. In spite of the rather uneasy trick, the game is fun to play, and although rather easy for experienced adventurers, most people should get a lot of enjoyment from it.

In the next few weeks, I hope to find what *San* (Damon) [the hero of *Franklin's Tomb*] gets up to in space. I did hope that he would reveal the phone number of his sister. Ah, but I fear this is not to be. I am looking forward to seeing what the next batch has in store for me too when the next play has all gone, and I'm sure that I'll find programs that I'll wish to include in this selection. ■

ALTHOUGH THE DRAGON 32 has now arrived on the scene there is still no time to wait from Dragon Data on official upgrades for your faithful 32. In the meantime independent sources are already offering ways of upgrading the 32 towards the specifications of the 64.

The most immediately obvious way is add more memory to your Dragon 32 to fill the cartridge port area with RAM and this approach has been taken by Memory Microsystems which manufactures a cartridge that can contain up to 144 of battery-backed non volatile CMOS memory.

The module has full buffering on the data address and control lines together with the necessary decoding circuitry and RAM. The version shown in Figure 1 has sockets for 6 x 2K chips but only two of these are fitted in this 4K example.

Other normal low-power or ultra low-power CMOS static RAM chips may be fitted, the only difference between these being the price and the power consumption. A fitted battery is fitted which is recharged while the module is plugged into the Dragon and a memory protect switch is provided to prevent accidental read/write operations and also allow removal of the cartridge.

Advantage

One advantage of this system is that data in the cartridge will be retained as long as the battery power holds up. The retention time varies according to the amount of RAM fitted and the type selected but varies from 63 days for the 4K version with ultra low-power CMOS to 4-7 days for 144, with normal low-power CMOS. The cartridge area is not available directly to Basic, but therefore a third machine code routine must be used to transfer data in and from the module although access limits are easy (see Table 6.4.4.10).

The module thus provides a virtually instantaneous method of storage and retrieval of data for the non disk user who might find it particularly useful for temporary storage of programs under development. Another obvious use is holding utility programs and in addition the module could be used to simply provide extra memory for data or to transfer data/programs between Dragon computers.

Prices range from £40 for 4K to £100 for 144 of normal CMOS with prices for ultra low-power RAM being about 18 per cent higher. The main advantages of this method of adding memory are that data and programs can be easily stored for extended periods and of course as the case of the Dragon does not have to be opened your original Dragon Data warranty is not affected. On the other hand as CMOS RAM is still expensive it is available that this upgrade is not cheap. In addition adding memory externally in this way does not allow the versatility of memory handling available through internal modifications.

Microcare of Rode Heath (Berkshire) Ltd in conjunction with Microcare of Thame states: "Landed will carry out internal modifications to your Dragon to expand

Added RAM power

**Keith and Steven Brain
investigate the various
upgrades offered for your 32**

the memory of your 32 to 64K for £30 (with a free copy of a FORTH implementation between)

Microcare began its last year when partners Eric Brooks and Peter Gasston noticed a shortage of computers for the then new Dragon 32, and set about trying to fill it with their own product. With suitable discontinuation they provided a modest rate of growth in the market but were actually amazed to find that they had to continually double and redouble their production rate to keep pace with demand until they have currently become one of the major suppliers in the trade in this area.

They then examined more serious hardware projects for the Dragon and came up with a 64K upgrade for the machine, which has now been available for some months. Although this conversion has not been generally advertised, Microcare has now modified over a hundred machines for individuals who have recently heard of their capabilities on the magazine.

The basic architecture of the Dragon upgrade is very similar to that of the Tandy Colour Computer and a real con-

vert of technical information on this was already available in the numerous CoCo magazines from the USA. The philosophy of what must be done seems therefore relatively easy to define.

As well as actually physically replacing the RAM chips it is necessary to reassign the pin pins, rearrange the hardware lines to access the extra memory and make a small number of physical fixes on the board. One of the first problems that they found when they came to upgrade Dragon 32s was that there are at least seven significantly different versions of main board all of which need to be treated differently.

Although all versions contain 32K of user RAM the value is achieved in a number of different ways. Most Dragon 32s contain 16 x 18K 6401 chips. Early versions have half of these on the main CPU board itself with the second eight on a page-able board mounted above these (Figure 2a). Later versions have all sixteen chips mounted on the main board itself. Smaller numbers of boards contain either 8 x 32K RAM chips or even 4 x 64K RAM chips. (Although in fact the 64K chips listed in these cases are supplied to Dragon Data as only 'half good' and only one side was actually connected to give 32K).

As none of these chips is socketed, it is difficult to remove them without specialist equipment or a combination of a lot of patience and a reasonable amount of experience of desoldering. The latter (who is very sensitive to telephone calls both side parents) indicated that he emphasised at this point that this is NOT a job to be done by a novice on the kitchen table whilst everyone else is busy watching Dallas.

Replacement

In 4000 static Microcare replaces the existing RAM with 6 x 64K chips. Where 64K chips were originally fitted these are tested and only replaced where necessary (you might even get a rebate). The standard of the conversion is very professional.



Figure 1 Memory Microsystems cartridge - up to 144



Figure 2a. Before the firmware upgrade and...

and if you take a quick glance at the before (Figure 2a) and after (Figure 2b) photographs you are very likely to get them the wrong way round. As in this case there are actually fewer chips after modification.

The conversion has been designed so that 'permanent' physical modification to the board is minimised, although such some components some 'back-cutting' on the main board is unavoidable. Where joints are pre-wired to be disconnected this is arranged by lifting ceramic sockets to the original board locations and then clipping relevant pins on these rather than modifying the ICs themselves. Each machine is thoroughly tested by Microscan both before and after modification.

Unauthorised

Of course this unauthorised work will void your Dragon Data warranty but, if you own one of the many Dragons which are now more than 12 months old, this should not worry you too much as Peter Dawson claims that no reputable Dragon Service Agent should have difficulty dealing with the modified board. The conversion is only available direct from Microscan which has so far been operating a virtual return of post service.

The manual pointed with the upgrade was originally designed for the unauthorised who already had a reasonable amount of technical knowledge but it is currently being revised as the potential reworking has expanded. After conversion the modified Dragon 32 contains 64K of RAM accessible to the user in a similar way to that in the Dragon 64. On power up the machine appears and behaves in exactly the same way as a standard 32.

In this mode the area from 40000 to 400FF is allocated to the Basic ROM and cartridge port as usual (map type 0). Now that you have the upgrade you can switch to map 1 by simply altering the appropriate register in the I/O (Synchro-nous Address Multiplexer) chip by POKing any number into location 400FD. This gives you almost 64K of available RAM but absolutely no control over this area as the ROM memory area

has been switched out, everything is giving instruction to the CPU.

Clearly this is of no value whatsoever unless you take steps to regain control. To be able to switch it back mode you must copy the contents of the ROM into RAM. Microscan provides a machine code ROM-2-RTT program in the basic code which carries out the task for you automatically when you CLOAD it as usual in 32K mode and then EXECUTE. This gives you a copy of Basic in RAM in exactly the same position as it normally occupies in ROM. This will run all existing Dragon 32 software as usual. However, in addition the old cartridge port area now contains almost 10K of RAM which can be accessed by the user.

The only drawback to that as this area is above Basic it is not recognised by the system and can only be reached by machine code routines or PEcking and POKing from Basic. As the Basic is running in RAM it can be modified (as usual) by the user but on the other hand the speed loading POK-2-RTT is still



Figure 2b. afterwards... fewer chips after the modification

not now work as this does not operate on RAM memory. Of course you can use the copy of Basic in RAM to LOAD another language (such as FORTH) and then call up the new language which can access the Basic RAM area as well as usual as this is no longer required.

Problem tackled

As we described in last month's issue of Dragon Clear, Dragon Data has tried two copies of the Basic ROM to their new 64, the second being a reassembly of the source code at higher locations to get around the problems of the code being position-dependent. Microscan has solved that problem in a slightly different way by also having available a ROM2-RTT program in an extra 2K of which first relocates the Basic ROM contents to the top of memory and then relocates all the absolute addresses in this area to the correct values now required to give you a full 48.5K of memory directly available to Basic (as in the real 64). It is not clear at this point how compatible this version is with the second ROM on the Dragon 64 but, for example, it will not contain the new key intercept routine implemented on the 64.

The manual points out that it may be possible to copy ROM cartridges into RAM but takes pains to point out the legal implications of such action. It currently seems morally preferable to us for users to take such action with their own cartridges, so that he can take full advantage of his machine and in any case the hot-shot cartridge manufacturers often include 'anti pirate' routines in their ROMs which write garbage all over the code if it is transferred to RAM to prevent just such copying! Where a utility ROM cartridge is integrated with the Basic it is usually necessary to use a modified version of the ROM2-RTT program to move the routine to RAM.

Microscan has been running the 64K upgrade in conjunction with the Premier+ Commodore Data disk drive system for some time but compatibility of the original Dragons has not yet been thoroughly tested. As long as Data is generated from the ROM in the cartridge it functions

	MAP TYPE 0	MAP TYPE 1
40000-400FF	I/O only	I/O only
400FF-401FF	Cartridge Port	
40200-40300	Basic ROM	User RAM
40400-40500		User RAM
40600-40700	Video Display	
40800-40900	System I/O	

WINDRUSH MICRO SYSTEMS



MACE by Graham Train
EDITOR
ASSEMBLER
MACHINIST

THESE RESULTS ARE

11. [20] *Large subalgebras of separable Banach spaces*, *Proc. Amer. Math. Soc.* **80** (1982), no. 1, 111–114. MR654042 (83d:46011)

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Q. Did you know that the [redacted] was a very professional and
competent person?



D-BUG by Stewart Road
TRACER
MONITOR
DISASSEMBLER

C. 20. 98:
DECOM TO CATERING

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There is a common saying among those of us who are involved in the development of new products or services, and that is, "if you can't sell it, don't make it." This is a very good rule to live by, and it is one that should be followed by all of us who are involved in the development of new products or services. It is a rule that is based on the fact that the only way to know if a product or service is worth making is to see if it can be sold. If it can't be sold, then it's not worth making. This is a very simple rule, but it is one that is often forgotten. So, the next time you are involved in the development of a new product or service, remember this: if you can't sell it, don't make it.

[illegible][illegible]

1. The first step in the process of developing a business plan is to conduct a thorough market research. This involves identifying the target market, understanding their needs and preferences, and analyzing the competitive landscape. Market research can be conducted through various methods, including surveys, interviews, and focus groups. The goal is to gather valuable insights that will inform the business strategy and help identify potential opportunities and challenges.

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BUG ZAPPER

170 171 172

00000000 00000000 00000000



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2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 2680, 2681, 26

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6809 FLEXTM
SOFTWARE / HARDWARE

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A breakdown of machine code

Bruce Devlin gives some hints on writing your own machine code programs

MOST PEOPLE are against learning machine code because they think of it as being too advanced and too difficult for them. What they don't realise is that machine code is only as difficult as you want to make it. The only stupid thing about machine code is that the machine is running fast, and very fast with no safe DEBUG key to help you out when things go wrong (as they inevitably do). The official approach to writing a program will not eliminate all the horrors, but it will make it a lot easier and quicker to write.

The first step is to sit down with a pencil and paper and decide on what the program will do. Once you have thought through just about all the possible actions somebody could make, the real thing to decide on is what modules you are going to have. A module is a sub-routine (or set of sub-routines) which performs a certain task. For example in a typical arcade game modules and sections would be:

1. Move the ship to the standard cell to the left or right
2. Move the bullet to square up the screen
3. Move the bug in a random direction, change its colour and check to see if it has been hit by the bullet
4. Clear the screen in black
5. Prints the message font
6. Generates a random number
7. Resets the game ready for another go

Individual modules

The individual modules should now be planned. Do not write any code at this stage. Simply write down what actions occur, which things to happen, and what errors you must check for. Once the modules have been planned the next thing to do is plan the section which joins the modules together. (If you choose to structure for your modules was good then this will be very simple). Finally write the program down on paper and then enter it into the computer. This way you will eliminate most errors before they even reach the keyboard, let alone crash the system by just taking off your hand work.

The benefits of modular programming for machine code cannot be too highly stressed. Each module should be designed individually before being run with the rest of the program. Although it may not seem like it this is probably the quickest way of getting an idea out of your head and on to a screen.



FIG. 1



FIG. 2



FIG. 3

Decisions while running

Now that you have an idea of how to write the program you will see that decisions have to be made during the writing of it. These decisions can be made with the use of the CMP (Compare) function. But many times require the use of the logic group of functions.

Logic deals with true/false values which can be represented as On/Off (SV/0V).

electrically and as 1/0 in binary. As there are only two states to be represented, the most compact way of storing binary values is as one bit. This means that eight logic values can be stored in one byte. The question you should always ask is: How do you do things with one bit? In reality this isn't possible; the electronic circuit used to shift bits is a maze, but with simple tricks with numbers and the knowledge of a few logic instructions you can handle one, two, three... up to eight bits at a time.

The instructions you need to know are AND/OR/EXOR/NOT. Each of these functions requires two inputs, each of which is one bit. One of the inputs is either bit A or bit B, so you must load one of these registers with a number to begin with. This number could be the value of a register, but the second number can be address, not any way you like (ie memory, indirect, a register etc). The AND then takes each byte and keeps up the corresponding bits in each so that bit number 0 of each byte is AND/OR/EXORed together and stored in bit 0 of the accumulator, and so on. How each of these functions works is shown in the truth tables at figures one to three.

A few examples of these functions should prove the way by showing what size they can be. A random example: LDA #50 — put 50 into A accumulator. ORA #50 — exclusive OR with the number 50.

To work out the result of this calculation, first convert into binary:

50 = 0011 1111

50 = 0011 1111

Calculating ORing each bit gives binary 0100 1010 = decimal 74 (decimal).

An example which will prove to be more useful is the following:

LDA #NUMBER — A = contents of memory location NUMBER

AND #32 — A = A ANDed with 32

Let's do the sum with two possible values of NUMBER: 107 and 309.

107 = 0110 1011

32 = 0010 0000

AND = 0110 0000

309 = 1100 1101

32 = 0010 0000

AND = 0010 0000

You can now see that the result will be 32 if bit number 5 is set and 0 if bit number 5 (counting from zero starting at the 0).

• right) is not set. We have just done an operation on a single bit. To test to see if a bit is set use the AND instruction and the numbers 1, 2, 4, 8, 16, 32, 64 and 128. The AND instruction does have to drawbacks. It changes the result of the register permanently. That is where the BIT instruction comes in. BIT will do exactly the same as the AND instruction except that the result is discarded and the flags only are set (remember the similarity with CMP and SBC).

For example, when testing to see if the keys 'B' and 'C' are pressed on the keyboard, a mask is put into the keyboard column output, leaving only one of its bits set zero. The mask are then tested (anytime having a zero bit has a key pressed). Assume the A accumulator contains a row of data, 8 bits 2 or 5 are set then 'B' and 'C', respectively are being pressed.

```
BITA #02 — check for 'C'
BCC @ZPRESS — jump to @ZPRESS if bit is zero
BITA #4 — check for 'B'
BCC @BPRESS — jump to @BPRESS if bit is zero
```

Zero result

If the last instruction was AND rather than BIT then BITA 4 would always yield a zero result because the AND instruction would have cleared all bits except possibly bit 5, the content of flag.

Of all the uses of the OR instruction setting bits must be one of the most common. With the AND instruction, where we there was a zero in the data, that would be a zero in the result. With the OR instruction, whenever there is a 1 in the data, there would be a 1 in the result. A good example of a text-based graphics. To generate a random graphics shape from a random byte in the B accumulator we must first make sure that the top bit (bit 7) is set otherwise we may get a test greater (CHR (128) up to CHR (255) are the graphics characters). ORB #128 or B with 128 decimal = 50hex

Getting adventurous

We now have a random graphics shape. Let's be more adventurous and create a standard coloured text shape. It will include the bottom four bits control the shape and the top four bits control the colour. To add a shape to our random colour we must first blank out the shape that is already there. ANDB #F0 — clear lower 4 bits

You will notice I call an exercise using HEX. This is because 1 hex digit represents either the top or bottom four bits. Using HEX is therefore much easier to visualize the bit patterns without writing them out. Now let's add a shape to our colour. The number 8 is the shape.

```
ORB #8 — add the shape
There three instructions are all that is needed
```

Another use

Another use of this bit manipulating is to quickly read the text screen cursor position. If D contains the address of the text cursor on the screen (the bottom 8 bits will give a value of 0-31 which will be the horizontal (TAD) value of its position

```
LDB #0 — load text cursor address
ANDB #31 — clear all bits of B except lower 5
```

B now contains the TAB position. The BCR instruction can be used to invert bits. If a 1 is present at any bit position then the BCR instruction will invert it.

```
LDB #80 — binary = 0110 0011
CBRA #2 — after bits A = 0110 0001
CBRA #2 — after bits A = 0110 0011
```

This is because 2 in binary = 0000 0010 so bit number one was inverted every time. This is used in the Dragon to control the speaker by oscillating a bit in an output port.

Shift instructions

A group of functions complementary to the logic instructions are the shift instructions. As their name implies, these instructions shift a byte one bit to the left or right. The bit that drops off the end is stored in the carry flag in the Condition Code register. The instructions available are as follows:

```
ASLA/ASRA — arithmetic shift left/right accumulator (could be B)
```



```
LSLA/LSRA — logical shift left/right accumulator (could be B)
RCLB/RCLB — rotate left/right accumulator (could be B)
```

If we leave off the last letter which specifies an 8-bit accumulator, it is possible to use any of the above instructions directly on memory. eg ASL \$50A1 will perform ASL on location \$50A1 and store the result in location \$50A1.

To see how they work imagine that A1 are bits with values 1 or 0.

```
Shift left before: 1000 1011 carry = 1
after: 0001 0111 carry = 0
```

The '1' bit will depend on which of the shift instructions was used.

```
ASL: 7 ← 0
LSL: 7 ← 0 } ASL and LSL are identical
ROL: 7 ← 1
```

For example, let B = 110 decimal = binary 0111 0100 and the carry flag = 1. After ASLB B = 1110 1000. LSLB B = 0001 1000. ROLB B = 1110 1001.

Notice that both ASL and LSL are equivalent to multiplying by two (B = 232).

```
Shift right before: 1000 1011 carry = 1
after: 0100 1011 carry = 0
```

The '1' bit will depend on which of the shift right instructions was used.

```
ASR: 7 ← 0
LSR: 7 ← 0 } ASR and LSR are identical
```

ROB: 7 ← 1

For example, let B contain -41 decimal = 1111 0111 (= 255 unsigned carry = 0). After ASRB 1110 1011 carry = 1. LSRB 0110 1011 carry = 1. ROLB 0110 1011 carry = 1.

Note that ASL is equivalent to dividing a signed number by two — B now contains -20 which is 8111 (-41/2). LSL is equivalent to dividing unsigned number by two — B now contains 107 which is 1101101/2.

One of the most exciting uses for these shifting instructions is for high resolution graphics games (see below). To move a sprite (small character such as a spaceship) smoothly across the screen, a picture must be shifted between bytes. On the Dragon colour pixels are represented by two bits in a byte (4 pixels to a byte).



where the bit pairs in blue and red are the numbers of the colour in that pixel. This means that if a = 3 then colour 3 will appear on the screen.

If we take a 16-bit number with code 0000 0000 and shift it to 0000 0000 0000 0000 a would appear that our picture had shifted one pixel to the right. A further shift would give 0000 0000 0000 0000.

To accomplish this the 16-bit number would be in the D accumulator. The instruction LSRA would chop the end bit into the carry flag and shift a 0 into the left-hand-side. RCLB would then shift the carry bit into the left-hand-side of the B register. Repeating this would give us the required shift. This is the basis on which the program moves the 4 × 4 colour spots left and right.

Addressing modes

There is little about the 6502 mentioned so far that is really different to any other processor on the market. What makes the 6502 such a powerful and flexible machine is its addressing modes. It would take a complete book to describe the operation and application of each mode so here the basic functions of each mode will be given. The names of the modes are not important, but the way they work is.

Immediate instructions such as CLRA, INCB, INCB, MUL, ADDA (X = X + B where B = 0 - 255). These instructions do not need any other data except for the register which is given with the instruction. Immediate instructions such as ADCB #4, ORB #0F, CMPE #0000. Here the data is a number in hex or decimal (some assemblers allow ASCB codes to be given as data). For example ADCB #4 will add 4 to the contents of the B accumulator.

Extended instructions such as COM \$0A, STX \$000A, JMP @START, ADD @VALUE. Here an address is given for the instruction to use. In the case COM, complement the contents of location \$0A. JMP is the address given by the label @START and the contents of the location @VALUE and @VALUE + 1 to the



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Bottom Layer: Logic is implemented by an already computer design and maps real observables with their functions. It's difficult to write to Logic that is not unique.

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Direct: This is similar to Extended except that only the lower byte is given with the instruction. The upper byte is contained in the CP (Direct Page) register. Using the addressing mode gives faster and smaller programs. For example:

LDA #543 — A ← 543H

TFR A,CP — Load the 8-bit CP register

LDB #1000H — Load B with 0100H

causes direct addressing

The above example would only work if @LOOH was on page 4140 (ie the top two bytes of its address were 4140). Care must be taken that BP is correct. For Basic the BP is 0. Make sure this is so if you return to Basic.

Indexed: There are many different types of indexed addressing modes of which you have noticed 4 distinct (see below). The register R1 in the examples below defines R1 = 11, or 8.

For addressing LDA, B is an example where the B register contains the address of which the bytes we wish to load A with can be found.

For R addressing: STB 0 X is an example. This is a modification of R addressing. Here the address is given by R+ (contents of R). In this example if X contains 44H, then the R will be stored in location 44H+25H, i.e. can't be any number between -32768 and +32767.

rA addressing: **INC R4** is an example. Here the number 4 in the last case is replaced by a register *r* which can be A, B or D. The contents of this register (a signed number) is added to the register *R* to get the final address.

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This is the same as R addressing except that after the instruction has been executed the R register is incremented by either 1 or 2 depending on the number of bytes. CMPEB Y ← null compare B with Y and then add 1 to Y. LDH B ← null load B from the stack stack (adding 2 to the stack pointer) so that it points to the next stack frame in the stack.

LDI *Rn*, -(*Rn*) addressing (autoincrement)
This is similar to autoincrement except that the register is decremented before the instruction is performed. STG -4 will store the R register on the user stack and leave the stack pointer pointing to it (the stack pointer points to the location on top of the stack, not at address 0). For STG

is FOR addressing (program counter relative). This addressing mode is one that is primarily only found in the instruction sets of new and mainstream computers. To the programmer it means that you can write a program which will work whenever you get new hardware.

Indemnity, advertising. This is best illustrated by the following example:

LOAD 2,4 — Load 4 from the Institute of X
load 10 10

LD4, Y — load *A* from the location pointed
to by *Y*

This can be done much more quickly and compactly by using `LOAD(2,0)` which means load 4 from the address at 2. If

Other addressing modes can be used with this indirect addressing such as `INC [R0]`, `SUBA [R0, #1]`, `STB [R0, -1]` etc. (Note that if indirect addressing is used then `dupl, dupl, register, r16, r17, r18, r19` may be used due to an address being 2 bytes long).

The instruction LEAR (r ← X.Y.U or S) is available for use with all the indexed addressing modes. With this instruction, instead of calculating the address of the data and then calculating/storing etc the calculated address is loaded into the register.

Let's see an example:
 LISTS is 1, 2 — will load X with the value of 1
 4, 5

LEMMA 1.1. — Let U be a \mathbb{Z} -module. Then the following conditions are equivalent:

LEAFY IS γ — will equal γ with the values of β in γ within $M = -1.26$ to -1.27

Note: however that $\text{LDS}(1, U)$ is the same as $\text{LDS}(U, 1)$. (Can you think of other examples?)

The last three instructions that are of everyday use are the subroutines instructions. These are JSR, BSR, and RTS. Jump to subroutines. Branch to subroutines and Return from subroutines. JSR and BSR first put the program counter on the stack (DPPC := 0) so that the instruction would be written if needed. RTS takes this value of the program counter and goes to the address (DPPC + 1) as before. It is therefore very important that in your subroutines, if you are the stack, you return it to the way it was when the subroutines was entered. Not doing so is one of the most common ways of crashing the machine.

You should now be in a stage to go out and buy an assembler and start playing with machine code. Cause you have a lot of experience in this you will be writing programs you never thought were possible. You will be surprised at how easy it is!

(Greetings courtesy of the Micro Centre in Rugby) ■

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Add some polish to your program

How do you make your program stand out from the rest? Margaret Norman reveals the finer points of program presentation with 10-Pin Bowling.

MOST COMPUTER GAMES are variations on a very few themes — copies of well-known arcade games, board games, card games and so on. So what can you do to make your version stand out from the crowd?

Well, the basic mechanics of the game are obviously important and if you can introduce an original twist, that's fine — but the way in which the game is presented is bound to be a major factor in setting out the success or the vice-versa.

Let's look at some of the minor details you will need to pay special attention to — the title sequence, instructions, high score tables and so on — and see how some of them can be applied to one game, a computer version of 10-pin bowling.

First impressions count

First impressions always count for a lot, so the program should begin with an attractive sequence. This is especially important if the introduction of program variables takes a significant length of time you don't want to leave the player staring at a blank screen while this is being done.

Obviously the sort of title page you produce will depend to some extent on the amount of memory space available, but even if you are restricted to the text screen there is no need to settle for just printing the program name in the middle of it. Here is a just one alternative to that:

```
10 CLS:
20 FOR I=1 TO 10:
30 READ A: A=ASC(A):
40 FOR J=0 TO 9:
50 POKE (1000+32+J+I), A: POKE
  (1000+32+J+1), 191
60 NEXT J:
70 POKE (1000+32+0), J: A=NEXT I
80 DATA NAME OF THE GAME
90 FOR DL=1 TO 800: NEXT
```

There are plenty of other options, of course; you could GET each point of the screen in a random order before printing the title in the middle, or perhaps produce a picture, using the STR\$() command with the title printed over it.

If you can use fancy graphics, then obviously the scope is much greater — you can DRAW your title in any style letters, upper or lower-case, in any colour and produce an elaborate pattern or picture as well. If you want to GET pictures into arrays as part of the program's introduction then it may be a good idea to incorporate these into your title page.

The bowling program shows one example of this — the words "10 PIN BOWLING" are DRAWN on the screen in yellow against a blue background, with the letter I in BOWLING replaced by a picture, then the ball to be used in the game is used to knock the picture down (Lines 40-180).

You will notice that the SCORES has not been set until after the letters and some have been DRAWN, so the picture will appear all at once rather than bit-by-bit. The colour used here has been chosen so that they will show up in black and white as well as in colour, for the benefit of those people who don't have colour televisions to use with their computers — not letters against a blue background, for instance, will not show up in black and white.

The other common element of the title sequence is a signature tune. If you can think of an appropriate song to go with your program, then you can use part of that — if not you can always make up some music for yourself (or if you're not musical, just try a few random octaves, some of notes and see which sounds best, as I did).

Joystick alternative

If your game uses joystick, then see if you can add a few extra lines to enable it to be played using the keyboard instead, for those people who don't have joysticks. If you do this, then it's a good idea to ask whether joystick or the keyboard are going to be used straight after the title sequence before the instructions so that you can give separate instructions for each. You can see how to do this in the bowling game, where alternative versions of the first two lines of instructions are given.

If the instructions for your game are very long and complex, or if memory space is tight, then you may prefer to provide written instructions instead of putting these all in the program, but there's a lot to be said for at least putting down instructions in the program itself in case the written instructions get lost.

Optional instructions

The instructions should be made optional so people who have played the game before can skip them, and each paragraph should be concluded with a request for a keypress, so people can take as long as they want to read it (just lines 210-230, 300-340 of my program).

Try to make the instructions as clear and concise as you can, and make sure all the words are spell correctly — it's worth spending a few minutes checking any you're not sure of in a dictionary. Test them on a friend — if they have any questions to ask you about the game after reading them, that's a re-write they've called for.

The instructions sequence will often be followed by requests for input — selection of the number of players, level of difficulty etc. Whenever you ask for some input, try to make clear what form you want it in and what range of values is acceptable, and put in a check to see that the input does fall within the given range (see lines 500-610 for an example of how to do this).

Levels of difficulty

The bowling program has only one level of difficulty, but with most games it is possible to cater for a number of different skill levels. However, there is little point in having dozens of levels of difficulty if the differences between them are only very slight; for most games, ten levels should be plenty. Generally, level 1 should be the easiest — if you have written your game so that any level 10 is the hardest and level 1 the easiest, then reverse the order with INPUT L, L=10:1.

There are lots of different ways of altering the difficulty of a game, though typically only one or two of these will be used in any particular game. If the game is fairly fast you can introduce a variable delay loop (eg FOR DL=0 TO 10*(10-L) NEXT DL or the number of "bounces" to be caught, evaded or shot, the accuracy of shooting required to score a hit, the time limit or the time the computer can take choosing its next move can be changed. Instead of allowing the player to choose the degree of difficulty at the start of the game you can do just what increases the difficulty gradually as the game progresses.

Next, the scoring. If you are writing a computer adaptation of a well-known game then it is generally best to stick to the scoring system of the original version as far as you can. If you can choose the method of scoring for yourself, however, there are several factors to consider.

Firstly, the highest score should normally be the best — so for a game with a time limit for instance, make the score on the time left at the end of the run rather than the time elapsed. ■

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```

1070 IF A$<L,F:G THEN J=0
1080 M=60000/2040
1090 FOR SL=1 TO 3000:NEXT
1100 NEXT PL,F
1110 REM END OF GAME
1120 CLS:PRINT#0,"FINAL SCORES:"
1130 FOR I=1 TO 2
1140 PRINT:PRINT"PLAYER"(I) " "(I*11,10)
1150 IF I=1,10:GOTO 1160 THEN 1240
1160 INPUT"HIGH SCORES: WHAT IS YOUR NAME "NAME(I)
1170 SC(I)=I*11,100
1180 FOR J=10 TO 2 STEP -1
1190 IF SC(I)<SC(J-1) THEN 1240
1200 T=SC(J-1):SC(J-1)=NAME(J-1)
1210 SC(J-1)=SC(J):NAME(J-1)=NAME(J)
1220 SC(J)=T:NAME(J)=T
1230 NEXT J
1240 NEXT I
1250 FOR SL=1 TO 5000:NEXT
1260 CLS:PRINT#0,"HIGH SCORES:"
1270 FOR I=1 TO 10
1280 PRINT NAME(I):TAB(20):SC(I)
1290 NEXT I
1300 PRINT:INPUT"WANTER NAME (Y/N)":G
1310 IF G<>"N" THEN 400
1320 END
1330 REM MOVE BALL, WAIT FOR FIRE
1340 BX=13:BY=25:I=0
1350 SOUND 50,1:SOUND 45,1
1360 PUT 180-10,BY-100-180+10,BY+101,B,PSBT
1370 IF PEEK(1430)=125 OR PEEK(1450)=254 OR PEEK(1450)=225 THEN 1430
1380 PUT 180-10,BY-100-180+10,BY+101,BL,PSBT
1390 IF I=0 THEN 1410
1400 A=20*BX+10:BY=BY-5=10*BY+10:G1 AND BY+100+5=10*BY+10:G1 AND BY+12:G1
GOTO 1360
1410 IF PEEK(1411)=225 THEN I = I + 1 ELSE IF PEEK(1431)=225 THEN I = 2
1420 BY=BY-5+11:G2 AND BY+100+5+11:G2 AND BY+12:G2GOTO 1360
1430 REM MOVE BALL ACROSS TO SKITTLES
1440 PUT 180-10,BY-100-180+10,BY+101,BL,PSBT
1450 FOR I=1 TO 25
1460 BX=BX+4
1470 PUT 180-10,BY-100-180+10,BY+101,B,PSBT
1480 PUT 180-10,BY-100-180+10,BY+101,BL,PSBT
1490 NEXT I
1500 REM CHECK FOR SKITTLES HIT
1510 G=1:G=0
1520 FOR R=1 TO 4
1530 FOR N=1 TO 5
1540 G0=(R-1)*4+G
1550 IF G0 OR H$<K:G THEN 1600
1560 G=BY-Y$G0
1570 IF ABS(G0)>=8 THEN 1600
1580 H$G0=INT(100*G0)/3/160
1590 G=0
1600 ON H$K+1 GOTO 1730,1610,1630,1640,1650,1660,1670,1680,1700,1720,1730
1610 H$K+1)=3:IF H$K+1)=0 THEN H$K+2)=0
1620 GOTO 1730
1630 H$K+3)=3:GOTO 1730
1640 H$K+4)=3:H$K+5)=0:GOTO 1730
1650 H$K+4)=4:H$K+5)=10:GOTO 1730
1660 H$K+4)=3:H$K+5)=0:GOTO 1730
1670 H$K+5)=3:GOTO 1730
1680 H$K+5)=3:IF H$K+1)=0 THEN H$K-1)=0
1690 GOTO 1730
1700 IF H$K+1)=0 THEN H$K+1)=0
1710 GOTO 1730
1720 IF H$K+2)=0 THEN H$K+1)=0
1730 IF H$10)=0 AND H$1)=0 THEN H$1)=0 ELSE IF H$10)=0 THEN H$11)=0
1740 IF H$11)=0 THEN H$12)=0
1750 NEXT N
1760 REM COUNT & BALKE OUT SKITTLES HIT

```

Continued on page 43

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```

1770 FOR H=1 TO R
1780 SW=SW+1:SW=SW
1790 IF H=SK1/20 THEN SW=SW+1:IF PPOINT(OR1,X1/20)+2 THENCPOLE(OR1,X1/20),Y1/20),B,SW
PRINT "X(OR1),Y(OR1),B,SW=ROUND(SW),1:ROUND(SW),1
1800 NEXT H
1810 REM MOVE BALL ACROSS TO NEXT ROW OF SKITTLES
1820 FOR J=1 TO 2
1830 SW=SW+4
1840 PUT(OR1-X1,SY-100-(OR1+10,SY+10),B,PSST
1850 PUT(OR1+10,SY-100-(OR1+10,SY+10),B,PSST
1860 NEXT J
1870 NEXT R
1880 RETURN
1890 REM STRIKE
1900 FOR J=1 TO 4
1910 PCL=J/2:1:ROUND(SW),1:ROUND(SW),1:NEXT J
1920 X=2*(F-1)+20:Y=22+PCL-1+50
1930 A=PCL,F=2
1940 PHOR4,B=SCREEN1,1:COLOR0,5
1950 LINE(1,Y)-X+20,Y+10,PSST:LINE(X+20,Y)-(X,Y+10),PSST
1960 RETURN
1970 REM SPARE
1980 FOR J=1 TO 4
1990 PCL=J/2:1:ROUND(SW),1:NEXT J
2000 A=PCL,F=1:PHOR4,B=SCREEN1,1:COLOR0,5
2010 X=4*(F-1)+20:Y=22+PCL-1+50
2020 DRAW"SP"+STR$(X)+", "+STR$(Y)+" "+SW:GOTO 1:1:END OF 1"
2030 RETURN
2040 REM WRITE SCORE
2050 S1=INT(OR1/PL+R1+R,0)/1000
2060 D2=INT(OR1/PL+R1-D1+100+0,0)/100
2070 D3=R-PL,R1-D1+100-D2+10
2080 X=4*(R-1)+20:Y=22+PCL-1+50
2090 DRAW"SP"+STR$(X)+", "+STR$(Y)+" "+SW:D2)+R1+D2)+SW:D3)
2100 RETURN

```



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Try the TV test

John ap Iwan explains how to test a television's suitability for use with your Dragon

IT IS OFTEN very useful to have available a program which allows the display on the television screen of a set of patterns which will enable you to judge whether there is anything the monitor will just eat. This could be used whilst setting up a television which has not been used on your computer before, or if you are so inclined to service or adjust a set. An accompanying stereo sound test is also useful in some cases such as when adjusting the tuned to colour bars and picture.

In writing this program I have attempted to provide as much useful information as the screen as possible. These separate test screens are provided.

The first on the test screen is a colour bar chart on which the colours are identified by their name and number within the Dragon colour set.

The second screen is put on to pages 1 to 4 of the graphics memory and is used in

the high resolution mode and white PACE-4. This test consists of a central circle (permitting both vertical and horizontal intensity checks to be made) various black and white rectangles (in order to note the purity of the signal) and four bars (to test the matching power of the set).

Dragon's good design

This diagram, rather well how the Dragon has been designed to operate within the performance limits of the domestic television receiver which has a integrated ability to carry the higher resolution graphics images produced by computers. It is no use having a computer which has a higher number of pixels per line than a Dragon unless you are willing to go to the expense of buying a monitor set.

The third test chart is put on pages 5 to 8 of the graphics memory and simply generates a colour bar pattern which can

prove very useful in checking the correct adjustment of the colour convergence of earlier colour sets. It is also a severe test of whether a colour set will give an interesting non-aliasing image.

Changing from one test chart to the next is effected by hitting the space bar down until the required pattern appears.

The sound generating subroutine at line 540 is used also to check whether a key has been pressed so that the test chart in the programme will appear. This subroutine is used in many places in the program.

The program will read at line 70 showing the title page and spending a steady rate unless a key is pressed.

When the key is pressed for the first time (line 80 to 440) will begin displaying the colour bar chart. Once the test screen has been cleared in line 85 the chart is built up by PACEing the test screen memory locations rather than using the

```

10 PCEM=0
20 : TEST CHARTS at 1.2.20. 0.0000 1.0000
30 CLR
40 PRINT#SCREENS,"TEST CHARTS WITH SOUND"
50 PRINT#SCREENS-5,"Press colour bar to proceed"
60 PRINT#SCREENS,"1 to 4 on screen 2 to 8"
70 GOTO 100
80 CLR
90 FOR P=0 TO 31
100 PACE 100+P,100+P,100+P,100+P,100+P,100+P
110 NEXT P
120 FOR P=1 TO 24
130 PACE 100+P,100+P,100+P,100+P,100+P,100+P
140 NEXT P
150 GOTO 1
160 FOR P=0 TO 15
170 PACE 100+P,100+P,100+P,100+P,100+P,100+P
180 NEXT P
190 FOR P=0 TO 7
200 PACE 100+P,100+P,100+P,100+P,100+P,100+P
210 NEXT P
220 PACE 100+P,100+P,100+P,100+P,100+P,100+P
230 FOR P=0 TO 15
240 PACE 100+P,100+P,100+P,100+P,100+P,100+P
250 NEXT P
260 FOR P=0 TO 7
270 PACE 100+P,100+P,100+P,100+P,100+P,100+P
280 NEXT P
290 FOR P=0 TO 15
300 PACE 100+P,100+P,100+P,100+P,100+P,100+P
310 NEXT P

```

```

320 GOTO 100
330 FOR P=0 TO 15
340 PACE 100+P,100+P,100+P,100+P,100+P,100+P
350 NEXT P
360 FOR P=0 TO 7
370 PACE 100+P,100+P,100+P,100+P,100+P,100+P
380 NEXT P
390 FOR P=0 TO 15
400 PACE 100+P,100+P,100+P,100+P,100+P,100+P
410 NEXT P
420 FOR P=0 TO 7
430 PACE 100+P,100+P,100+P,100+P,100+P,100+P
440 NEXT P
450 FOR P=0 TO 15
460 PACE 100+P,100+P,100+P,100+P,100+P,100+P
470 NEXT P
480 FOR P=0 TO 7
490 PACE 100+P,100+P,100+P,100+P,100+P,100+P
500 NEXT P

```

Continued
on page 47

OPERATION GREMLIN . . .

A very different game that combines the intrigue of adventure with the real time machine code speed of arcade action. The player must control not one, but EIGHT different weapons each with their own character status. In the search for the weapons that will destroy THE GREMLINS.

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OPEN FILE FOR DRAGON USERS

liberal in your Dragon programme: beginning with a general description and then explaining how the program is constructed. Take care that the findings are of high-level, involving a cascade and, if possible, a printout. We pay £5 for each (supplies: program published) double for the program of the month. If you have any problems with the findings, please send your queries to the appropriate author. Dragon club, 12-13 Little Newport Street, London WC2E 8RN.

Soft

1000

THE RULES OF Golf are roughly the same as those of the famous points system. You have 100 holes and 100 balls. The holes are arranged in a cross pattern and the balls go in the holes. The central hole is left empty.

A ball is dropped if whether it tends to jump out of the ring as simply hole. The object of the puzzle is to remove all of the balls apart from one, which must be in the center hole at the end.

Keynote: *Intelligence systems: essential tools for modern police* / *Intelligence systems: essential tools for modern police*

- 1 I can record at any time your current position and money
- 2 Using the recorded data you may update it with further moves and the reason it
- 3 Or you may wish to review a successful or all your moves up to this place
- 4 During this review made it will return control to the keyboard and manual operation. This means that any recorded Scott data can be updated there any point up to the recorded position. This makes it possible to add moves.

To move a cell after its coordinate printing Color uses each one, then use an arrow key to give directional jump, and press 'Enter' again. Each operation can be changed by using another key before 'Enter' or by pressing **Esc**.

- D — Dance move
- M — Interval mode
- S — Save position
- R — Restart position

The computer then asks whether you wish to see any searched data. If the answer is yes, then you can choose from three suboptions: none.

1. Move all records up to recorded position
2. Review all records up to recorded position automatically
3. Review all records up to recorded position (ENTERING each separate record manually with manual cursor)

Solutions to the puzzle can be obtained for £1.95 (including postage and packaging) and cassette) by writing to: M. Spenser, 48, Ashcroft Road, Chesham, Bucks HP8 4NR.

[illegible]

What's your best source of information on color computing?



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[illegible]

Wave

1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 26

[illegible]

Screen print

As with most printers, the GMP 130 uses a 5x7 pin printing head. It prints its graphics patterns on a 1x1 grid in a binary format — eg. 11000011 — one dot at the top and two dots at the bottom (representing digit 1) top. The 130 code for this formation is formed by finding the decimal value of the graphic pattern and adding 128. For example 11000011 = 87 dec and 87 + 128 =

J. Janssen (Lecturing picture: page 100)

Figure 1

DRAGON 32 OWNERS

Make your Dragon *fun* into a real computer with the new Double-Density Delta Disk System.

Then Dallas State Northern College Now

- An affordable disk system.
- Powerful disk commands.
- Lets you produce and handle multiple, diverse files as easily as serial text.
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AVAILABLE.
SEND SAE
FOR DETAILS**

- | | |
|--|----------|
| 90-18-048789-0001 - portable D411A data Operating System, 4.0 software, 4.0 software, 4.0 software | \$125.00 |
| 9018-1 - D411A Cartridge Area Manual is single-sided 40-track 901801 cartridge code | \$150.00 |
| 9018-2 - 9018-1A 1.25 inch single-sided 40-track (D411A) drive | \$150.00 |
| Data interface module (supplied with D411A 1 to 3) | \$9.95 |
| DECDD-04 4.0 software (4.0 software) - (supplied with D411A) | \$24.95 |
| 9018-1 - DECDD-04 full, home postage not (D411A) | \$14.95 |
| 9018-1 - Data (Data Management) System: contributions (4.0 software) for D411A Software | \$5.95 |

TOOLKIT FOR DRAGON 32

[illegible]

- | | |
|---|---|
| <p>1. Full immersion into the language learning environment as they go to the country. Fully immerses in the classroom & in society.</p> <p>2. Input: PROBABLY ABUNDANT (KIND) - is usually comprehensive immersion.</p> <p>3. Acquisition: In the most intense form of immersion, students are surrounded by the language and are able to learn the language more quickly.</p> <p>4. Output: ABUNDANT (KIND) - (ABUNDANT) COULD SPEAK IN THE CLASSROOM.</p> <p>5. Self: (strong) (PROBABLY ABUNDANT) immersion is the most effective immersion.</p> <p>6. Costs: (very) low (EXCELLENT) value (but not in the short term).</p> | <p>1. (Self) (strong) (PROBABLY ABUNDANT) immersion is the most effective immersion.</p> <p>2. Input: (PROBABLY ABUNDANT) immersion is usually comprehensive immersion.</p> <p>3. Acquisition: (PROBABLY ABUNDANT) immersion is usually comprehensive immersion.</p> <p>4. Output: (PROBABLY ABUNDANT) immersion is usually comprehensive immersion.</p> <p>5. Self: (strong) (PROBABLY ABUNDANT) immersion is the most effective immersion.</p> <p>6. Costs: (very) low (EXCELLENT) value (but not in the short term).</p> |
|---|---|

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- **Disabling FORTH on the ROM chip** • Executes up to 10 times faster than BASIC • Single-line • Readable by any defined words • Words can even be defined using the ROM's assembler at maximum speed • BASIC and CHIL commands still available from ROM • Tokens used stored and can be compiled from disc • ROMs can be switched to disc, including new word definitions

[illegible]

14. Paul J. Pappas must identify each of the following as a component of the audit and explain why it is a component of the audit: (1) the audit plan, (2) the audit program, (3) the audit procedures, (4) the audit evidence, (5) the audit conclusions, (6) the audit report, (7) the audit opinion, (8) the audit findings, (9) the audit recommendations, (10) the audit follow-up.

[View all posts by](#) [David Mervin](#)

- RECOVER** (R) is the first computer program to allow scientists to determine what genetic information, from a single living organism, can be used to reconstruct the number and order of chromosomes. It allows recovery of the chromosome set from a single cell. RECOVER also allows scientists to analyze any set of chromosomes from a single cell and to compare the results with a known set of chromosomes. RECOVER is available on various computer languages. DRUGS research is in progress.
- Contact: 520 1st St., San Jose, Calif.

[Return to top](#)

- [illegible]



PREMIER

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Journal of Internal Medicine 247: 395–402
DOI: 10.1046/j.1365-2796.2000.01881.x

1. **Identify the problem.** The first step is to identify the problem. This involves understanding the symptoms and the context in which they are occurring.



[illegible]

HCF/LCM

THIS PROGRAM PRINTS the largest common factor (lcf) and lowest common multiple (lcm) of any two given positive whole numbers using Euclid's algorithm for the calculation.

- | | |
|---------|--|
| 90-99 | Input the two numbers |
| 99 | Check that they are positive
integers |
| 100-129 | Calculate the gcd |
| 130 | Print the gcd |
| 140 | Calculate and print the lcm |
| 150-170 | See if another evaluation is
required |

1. *Journal of the American Medical Association*, 2000; 283: 2686-2692.

ADIM — Used to calculate the total area. It holds the value of the total area.

2000

```

1  # 定义一个字典，存储学生的成绩
2  student_scores = {
3      '小明': 85,
4      '小红': 92,
5      '小刚': 78,
6      '小华': 88,
7      '小强': 95
8  }
9
10 # 遍历字典，打印每个学生的姓名和成绩
11 for name, score in student_scores.items():
12     print(f'{name} 的成绩是 {score} 分')
13
14 # 找出成绩最高的学生
15 highest_score = 0
16 highest_name = ''
17 for name, score in student_scores.items():
18     if score > highest_score:
19         highest_score = score
20         highest_name = name
21
22 # 打印成绩最高的学生
23 print(f'成绩最高的学生是 {highest_name}，分数为 {highest_score} 分')

```


A full library

To win Dragon Data's complete range of software, 70 titles in all, you must name an imaginary small business computer and solve the puzzle (with Gordon Lee's advice)

DRAGON, VIC20, Sinclair Spectrum and Cbc are names of home computers that are recognised around the world. Could you think of a name that will become equally as famous?

This month we want you to name an imaginary small business computer to be launched in 1984 and then solve the puzzle below. The winner will receive the entire Dragon software list for this 32 — 70 titles in all.

Here, don't forget that many leading computer manufacturers release a series of small business computers under one name, so what name you think of must be capable of expansion. For example, if you were to call the computer "Gamel" from the series could be expanded to "Gamel 1" and "Gamel 2" and so on. However, let your imagination run free with names. If you think of a good enough name we might be able to persuade Dragon Data to use it themselves.

But just how good is your idea as a puzzle? How do you go about working out a solution if you feel a possibly hard name? Firstly, you may find that you must adopt many kinds of approach to begin with — a satisfactory solution is one that which might call for a collection of words including a combination of all or any of cryptograms, crosswords, acrostics, anagrams, probability and logic, apart from just straightforward maths. As an illustration of this sort of thing, and to try out your ability, did you spot anything unusual about this paragraph?

Here are a few hints that you might find useful in solving puzzles of the type found on this page.

1. Read the question. An obvious clue may, perhaps, be overlooked as you plough into this but can be overlooked. Make sure that you know what is required. Have you calculated the maximum amount of information from the question? An odd sentence tucked away in the text may not mean much at first reading, but it may hold a vital clue later on. Is there likely to be a link anywhere in the question?

2. Plan the solution in stages. Work out how you are going to approach the problem. Have a look to see what your computer can best help you, and where the good old-fashioned pencil and paper is called for.

3. Writing the program. (How are you getting in the key here. Always check the wording of the question to see if there are any short cuts. For instance, you might find that in listing a series of numbers only the

Prize

THIS MONTH'S PRIZE is the complete library of titles from the official Dragon Data software list produced for the Dragon 32. At 70 titles currently in the market will be sent to the winner by Dragon Data Ltd. Adventure and word games, educational programs, languages, sound and graphics programs will be yours to use and enjoy.

Rules

YOUR ENTRY MUST arrive at Dragon User by the last working day in January. The winner and the solution to the puzzle will be named in the April issue.

November winner

THE WINNER OF November's competition and recipient of an MCP 48 Colour Printer/Plotter from Games and Computers at Martin Stoddard of Ringwood, Devon. He correctly stated that the most highest hit period was 6002.

even numbers need be considered. A simple line in your program will calculate that and halve the running time. Conversely, it is not efficient to write a couple of dozen lines if it so doing you take longer than the time that would be saved.

4. Check your results. Always check that the computer is doing just what you want it

to. Work out a couple of examples by hand if possible and see that the result is as expected. A bug in the program might not cause it to crash but it can give an erroneous result. For example, a wrongly placed set of brackets in an arithmetical expression — or when working out angles — are the results given in degrees or radians? Also, don't forget that the computer can only work out values to a certain number of significant figures, and this may also induce certain errors. Check you have some results check them against the original information. Does your answer fit the data?

5. Sleep on it. It doesn't aid your efforts if you all it reach a dead end, put the puzzle away and come back to it later. The need to be too inflexible as there may be an approach that you have missed. Ask someone else how they would tackle it. It may be that they can suggest a different interpretation that you have overlooked.

Obviously it is not possible to cover all eventualities, but you should now be better equipped to tackle some of these puzzles. A number of readers wrote to say that they had too difficulty with the September puzzle in Dragon User, so next month we will be taking a detailed look at the solution.

Now by your self at this puzzle. Professor Clio has the solutions. Mathematics has sent out his New Year cards to his room in code and statistics.

H	A	P	P	Y
N	E	W		
Y	E	A	R	

As with his usual position he also included a suitable brownie with the cards to ensure timely and puzzle his colleagues. This year was no exception and what Professor Clio asked them to do was to substitute digits for letters in the greeting, HAPPY NEW YEAR, so that each different letter is to stand for a different digit. This was to be done in such a way that the numbers represented by HAPPY and NEW were to be perfect squares, and the number represented by YEAR was to be prime. In order that they could solve the problem the professor also let them know the value of the letter R, but unfortunately I have forgotten what this value was.

What are the numbers?



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